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Technology Use in Rural Schools:

A Study of a Rural High School Trying to Use iPads in the Classroom

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The purpose of this case study was to explore how rural high school teachers and students, grades 9-12 use iPads in class, the obstacles and barriers to teacher and student iPad use, and the relationship between types and frequency of use, in one high school in Southern Oregon. The study consisted of classroom observations and follow-up interviews with nine teachers with iPad carts over a three week period. Qualitative data was emphasized, with some quantitative data to support it. Overall, iPad use was low, even though access to iPads was high. When iPads were used, teachers used iPads mostly for communication and delivering instruction, and students used iPads mostly for reading, writing, and research. Observational data and interview data results on the types of use were consistent, indicating that teachers are well aware of how they use iPads in their classrooms. The most common barriers identified by teachers were student and teacher attitude and preference. The low frequency of iPad use seemed to relate to the lack of learning activities involving creativity and collaboration.

Keywords: technology, integration, standards, barriers, iPad, mixed methods

Introduction

The study of technology use in instruction is relatively new, and specific studies focusing on the use of iPads are extremely limited because the devices were only introduced less than seven years ago (2010). The use of an iPad can be classified in several ways, e.g., a toy, a tool for several aspects of life like web search, use of various applications, or academically as a transformative learning device depending on how it is pedagogically implemented and used (Cakir & Yildirim, 2009; Hew & Brush, 2007). The goal of technology integration in schools in the Common Core era is to support higher order critical thinking (Ritz, 2009). As such, barriers like teacher attitudes towards technology, and presence or lack of administrative support and comprehensive professional development to high quality technology use in schools does need to be addressed if the call to technology integration is to be definitively achieved (Lowther, Inan, Strahl & Ross, 2008; Morehead & Labeau, 2005).

In schools today, there is a massive push to integrate technology throughout the educational process, however, there's very little consistent documented evidence of its success. The integration of technology into U.S. classrooms has led to a major shift in K-12 teaching and learning (Bebell, O'Dwyer, Russell, & Hoffman, 2010). The trend in many schools and school districts has been to invest millions of dollars to provide schools with the hardware, software, and infrastructure necessary to

bring educational technology into the learning process, because educators recognize that technology (including iPads, iPhones, and other mobile technologies) has permeated our society such that students need to be proficient with it in order to be prepared for life in the twenty-first century (Cannistraci, 2011). Despite the sizeable investment involved, schools and districts often do not track the use of technology to make sure the investment is valuable in its usage and to ensure they are being used effectively and efficiently in the classroom and for instructional purposes.

Recent emergence of Common Core and the International Society for Technology in Education (ISTE) standards and testing protocols require integration of diverse learning technologies, such as iPads, in classroom teaching. The Common Core State Standards (National Governors Association, 2010), which have been adopted by 43 states are assessed using computer-based tests such as the Smarter Balanced Assessment Consortium (SBAC (2012)). This shows the need for technology based learning in school classrooms as a part of everyday instruction in the Common Core so that students are familiar and comfortable with the technology before being assessed with it or on it (Fletcher, 2012). In fact, the Common Core College and Career Readiness Anchor Standards for English Language Arts and Literacy specify that students "use technology, including the internet, to produce and publish writing and to interact and collaborate with

others” (National Governors Association, 2010, CCSS.ELA- Literacy.CCRA.W.6). Additionally, the ISTE standards emphasize creativity, innovation, and collaboration among other important skills students should learn with technology (ISTE, 2015).

However, full integration of technology in instruction is far from being realized. One 2010 study of over 60,000 classrooms, from elementary to high school across 34 states with a variety of settings and socioeconomic levels, observed that 63 percent of teachers and 73 percent of students used no technology in any form (Pitler, 2011). Even as technology rapidly evolves, the integration of apps such as those for IOS/ Apple products (including iPads) in instruction was still in a stage of infancy (Jacob-Israel & Moorefield-Lang, 2013), that is just two years ago.

There are challenges in measuring technology use in the classroom. According to Bebell et al. (2010, p. 31) “past reviews of educational technology research found it was often limited ways student and teacher technology use were measured”, usually the measurements used self-reporting surveys. Few studies measure technology integration through direct classroom observation, even though observations “can provide a source of rich data to better understand technology use in the classroom” (Wetzel, Zambo, & Ryan, 2007, p. 26).

Although a single case study cannot tell researchers, decision makers and end users everything about technology use in schools, it is important to gather what data we can in order to contribute to the overall understanding about what is going on in rural schools regarding technology use today. Examining how one type of technology is being used in one school helps educators and the research community grow in understanding of the problems and needs regarding successful technology integration to improve teaching and learning, in this particular case, regarding rural school technology/iPad implementation and allocation of funds for such technologies.

Significance

Findings from classroom observations of current “educational technology acceptance and usage behavior” (Holden & Rada, 2011, p. 343), including identification of barriers which prevent technology from being used by teachers and students, will provide similarly situated schools and school districts decision-makers information to guide future technology plans, professional development experts,

and budgeting reasoning for technology purchasing and prioritization. Devices such as iPads will not improve or be determined effective learning tools if they are not being used. Since technology is constantly changing and evolving, planning for technology use in classrooms must also evolve using research based strategies.

The district in which the high school is located was at the time planning on assigning each student an iPad as part of a one to one digital conversion, therefore, it was helpful to have a baseline of how iPads were being used in the classes observed for this study to inform the decision makers about how best to implement such future plans. This will help schools and district “move beyond building up inventories of technology devices and focus instead on creating a clear vision of how technology should be implemented in the classroom” (Pitler, 2011, p. 44). Also, discovering barriers to iPad use helps administrators and instructional coaches understand the problems teachers face when trying to incorporate iPads into their teaching.

Purpose Statement

The purpose of this study was to investigate high school teachers’ and students’ use of iPads, the barriers to iPad use, and the relationship between the types and frequency of iPad use in rural school environment. In order to fully understand the way in which iPads are used in the classes observed, the following research questions were asked:

1. How frequent do high school teachers and students use iPads in class?
2. How do high school teachers and students use iPads in the classroom?
3. How does the way in which iPads are being used by teachers and students correlate to the frequency of use?
4. What barriers prevent classroom iPad use?

Limitations

The school used in this case study is located in a semi-rural farming community in a northwestern state. Approximately 1,050 students attend the high school in grades nine through twelve. Even though the teachers’ and students’ individual backgrounds, age, and experience may have played a role in their technology use, incorporating such individual information was beyond the scope of this study. This study did not seek to find out why certain uses and applications were more popular than others. This study also did not seek to discover a link between

iPad use and academic achievement. Therefore, the results may only be interpreted as a general “synopsis” of iPad use at the time of observation. Nevertheless, the observations and follow up interviews provided useful data to answer the research questions posed by the study. The findings of this study may be generalizable to other rural high schools due to the unique context as well as the goal to collect information of iPad use in rural education setting.

In order to avoid the problems associated with teachers and students self-reporting their technology use on a survey or questionnaire, including “the tendency of an individual to...select responses that are believed to be the most socially acceptable” or “what the researcher desires” (Gay, Mills, & Airasian, 2012, p. 159), the qualitative methods of observation and interview were chosen because they allowed much more objective information to be obtained. While it would have been more thorough to observe and interview all 47 teachers in the school on all types of technology, the study was limited to 9 teachers in English Language Arts and Social Studies classes with iPad carts due to funding and time.

Review of Literature

The framework that guided this study was the Technology Pedagogy Content Knowledge (TPACK) by Koehler, Mishra and Yahya (2007). The main goals of the TPACK are to inform technology integration design, as well as development and instruction in teacher education programs (Koehler, Mishra & Yahya, 2007). However, the initial TPACK framework didn't take into account inclusion which is a norm in schools and college classrooms. The TPACK framework offers significant promise to improving learning outcomes for all students when they receive instruction in the general education classroom settings.

Whether iPads should be used in classrooms is no longer the issue in education. The questions that need to be asked are; do teachers use iPads in the classrooms? If so, how and how often? An iPad is not, and may never be transformative on its own. It requires the assistance of educators who integrate technology into the curriculum, align it with student learning goals, and use it for engaged learning projects and effectively to create new learning opportunities and to promote student achievement. The literature review presents information about iPads in schools for its intended support in teaching and learning in K-12 schools.

The Goals and Impact of Technology in the Common Core Era

The goal of technology integration is integral to the Common Core curriculum requirements and standards. This is so because Common Core standards guide instruction to make sure students are prepared for twenty-first century careers (National Governors Association, 2010), and it is now considered essential for teachers to integrate technology into their teaching and students' learning, rather than an optional addition to instruction (Hall, Fisher, Musanti, & Halquist, 2006). As such, the Common Core State Standards must make students familiar or comfortable with technology as an important part of demonstrating their knowledge on the new assessments (Fletcher, 2012). The Common Core standards are also regarded as a call for the use of technology to enable higher-order problem solving, and not just to integrate technology for its own sake (Green, 2014). Therefore, instructional technology should support the curriculum within schools, and one worthy goal of instructional technology in education is to help students become independent and self-directed learners (Cannistraci, 2011), through the use of technology and iPads in particular because of agility, flexibility, ease of use and ease of mobility.

School districts nationwide have made multimillion-dollar investments in educational technologies in the belief that it will lead to improved learning and teaching and to the development and fostering of essential skills for students (Bebell, O'Dwyer, Russell, and Hoffman, 2010). While a variety of studies and some results show that access to technology might be robust in many educational setting, its actual use might be low (Bebell et al., 2010). Educational leaders and policy makers need empirical, research-based evidence that these massive investments are worthwhile and are affecting educational outcomes in the manner intended (Bebell et al., 2010).

Barriers to Educational Technology Integration

Several factors pose challenges to successfully integrating technology in education. One such factor is school administrators' and district-level support. Studies have shown that school level leadership and support for some kind of technology professional development initiatives, along with straightforward administrative policies for management, oversight, and accountability is needed; when this support is

lacking, teacher and student technology use is lower (Bebell & O'Dwyer, 2010). With regard to funding, districts must provide adequate funding (Herro, Kiger, and Owens, 2013) and resources (e.g. computers, iPads, etc.), as teachers report lack of technology as one of the major barriers to technology impacting their practice in the classroom (Pitler, 2011). Another barrier faced by many schools is the lack of adequate technical support and infrastructure to ensure success with technology (Herro et al., 2013; Cannistraci, 2011). Technical challenges might include the need to carefully plan the logistics of syncing and managing mobile devices as well as making sure the school's infrastructure and bandwidth are robust enough to support so many devices at once (Herro et al., 2013). These are some of the kinds of barriers this study sought to examine.

Just as administrative support is essential for successful technology integration, teacher technology familiarization is also essential. In Al-Bataineh, Anderson, Toledo, and Wellinski's 2008 study, respondents ranked lack of familiarity with technology as the barrier which had the most impact on teacher technology integration. Teachers who are anxious about learning how to incorporate new technology into instruction may let their fears get in the way of its effective use, and they may not be motivated to improve their current practices (Cannistraci, 2011). Studies show that teachers' comfort level with technology influences the frequency and ways in which they use it in daily lessons (Jahnke & Kumar, 2014; Al-Bataineh et al., 2008). Additionally, teachers' confidence in mastering new technology and their perceptions of the usefulness of new technology are essential factors in their intention to use it as a teaching tool (Holden & Rada, 2011). More important than teachers' subject area or grade level is teachers' commitment to technology immersion, since teachers usually nurture their students' use of technology in class, and higher 'buy-in' leads to higher implementation (Bebell & O'Dwyer, 2010).

Another barrier is the lack of appropriate professional development by school districts of technology integration (Fletcher 2012). In interviews with hundreds of teachers and administrators, Pitler (2011) found that one of the key barriers to technology making a bigger impact on teacher pedagogy is the lack of ongoing professional development that encourages teachers to collaborate so they do not feel they have to work in isolation to decipher how best to incorporate new technology.

Teachers also report a lack of familiarization and time to learn new technology skills, experiment, plan, and prepare lessons as challenges to using technology (Fletcher, 2012; Cannistraci, 2011; Al-Bataineh et al., 2008).

Comprehensive professional development programs must be ongoing, relevant, and connect educators through supportive communities of practice which include modeling, observation, and engaging in lesson scenarios using technology (Herro et al., 2013). An effective model for professional development is for staff to educate each other on how technology can support instruction and to incorporate peer coaching to improve student achievement (Fletcher, 2012). Studies show that without effective and sustained professional development focused on quality instruction, the investment districts make in technology will not impact achievement in the way intended (Cannistraci, 2011).

Mobile Learning with iPads

Mobile technology, including smartphones and tablets, is ever-present in the lives of modern learners, and mobile learning leverages this technology by allowing access to educational resources at anytime from anywhere as long as there's connectivity (Herro et al., 2013). This technology includes the benefit of being highly portable, individual, adaptable, and easy to use. Devices such as iPads can help eliminate "traditional barriers on time and space" for students (Rhor, 2013). Other benefits of mobile technology are that it can foster online communication, collaboration, and personalized learning (Jahnke & Kumar, 2014). It also can enhance project-based learning whereby users control the flow of information.

Even though the iPad was first released just five years ago in 2010, it has become a prevalent technology in schools due to its ease of use and its potential to facilitate creative content production and learning through its suitability of hosting various applications. The iPad has "penetrated K-12 faster than any other computing technology" (Norris & Soloway, 2012, p. 42). Unfortunately, empirical evidence on the integration and impact of iPads in K-12 classrooms is scarce (Jahnke and Kumar, 2014). Walsh and Simpson (2013) agree that research into the impact of touch pads, such as the iPad, on learning and teaching is in early stages, and results are mixed, showing both the benefit of increased engagement and the challenge of distraction from learning. However, Jahnke and Kumar's (2014) study

showed that students were engaged when creating artifacts and products using the iPads.

A 2010 study by Bebell et al. showed that teachers use computer technology mostly for class preparation and communication and more rarely for grading, delivering instruction, and directing students to create products. As opposed to desktop and laptop computers, teachers tend to use iPads for learning activities that focus on creativity, production and collaboration. Jahnke and Kumar (2014) found that it was important to research the behavior of teachers who were early adopters and who had “prior experience with reflective learning and technology integration” (p. 90) because their examples can be shared with teachers who are unsure or reluctant about integrating new technology such as iPads.

Student use of technology is hard to define, since studies may report results from different types of technology being used in different ways, and many studies of student technology use were conducted before the advent of the iPad. Although much has been supposed about the iPad’s ability to transform how students learn, there is a dearth of research exploring how students interact with such devices (Faloon, 2014). Pitler’s pre-iPad 2010 study observed that 73% of students used no technology, which is probably related to the 63% of teachers who did not use it either, since students are unlikely to use technology in the classroom if the teacher is not using it. The availability of technology varies from state to state and school district to school district, but when it is available, students have varying levels of engagement with it in the classroom (Jacob-Israel & Moorefield-Lang, 2013). Wetzel, Zambo and Ryan’s (2007) observational study found that students used technology for research and productivity more than communication and subject specific programs. Research tools included internet search engines and web sites; productivity tools included graphic organizers and presentation, word processing, and spreadsheet software. The difference with later iPad studies like that of Jahnke and Kumar’s (2014) show iPads to facilitate student collaboration and creativity, which may be harder to accomplish with older technology such as laptops.

In summary, the goal of technology integration in the Common Core era is to support higher order critical thinking. Barriers to high quality technology use in schools, such as lack of administrative support, teacher perceptions, and comprehensive professional development, may need to be addressed if technology and iPads can be efficiently and effectively used in

learning. Specific studies focusing on the use of iPads are extremely limited because the devices were only introduced five years ago. The iPad can be a toy, a tool, or a transformative learning device, depending on how it is used, which is why pedagogy must be taken into consideration in discussing learning with iPads. Furthermore, devices such as iPads may be available in schools but may not actually be used by teachers and students, as Bebell et al.’s 2010 study showed that actual use of technology might be low even in educational settings with prevalent access to technology. Therefore, the need to study on teacher technology acceptance and student learning outcomes with iPads.

Methodology

This concurrent exploratory mixed methods case study was conducted through classroom observations over 3 weeks and subsequent semi-structured interview. The case study consisted of the teachers at one high school with iPad carts in their classrooms. The researcher was aware of the potential for bias and approached observations and interviews without any pre-conceived ideas about what might be seen or heard, but simply took notes on visual and audio observations. This research design was used in order to gather comprehensive data on iPad use and to analyze the relationship between the qualitative and quantitative data. Qualitative methods were emphasized in order to take into account the unique context of the high school where the study took place, and the descriptive quantitative methods were used to gather an overall percentage of use versus non- use.

In this study, credibility was established by referential and interpretive adequacy. Also, the researcher sought believability, based on coherence, insight, and instrument utility (Eisner, 1991) and trustworthiness (Lincoln & Guba, 1985) by verifying responses with observations, and the interview was to attempt to verify the observations, rather than through traditional reliability computations. To establish credibility; the researcher tried through portraying a true picture of the phenomenon presented. To establish the transferability the study, the researcher provided details of the context of study and the areas covered for readers to decide whether same condition and program environments prevail similarly.

Population

Out of the population of 47 teachers at the high school in the study, criterion sampling was used to identify the 9 participants who met the criteria of language arts and social studies general education teachers with an iPad cart assigned to their classroom with approximately 850 students in repeat occurrences. Access to the participants through administration and consent forms for both teachers and students with main emphasis on voluntary participation. Participants were informed of the process and that participation or non-participation was a matter of choice and one could withdraw at any stage of study. Participants were assured that all reasonable steps were taken to protect their identity and their responses. Only those teacher/students who agreed to participate in the study by signing consent forms were involved in the study and participated in the interviews.

The school in this study is located in a semi-rural farming community in southern Oregon. The approximately 1,050 students attending the high school in grades nine through 12 include 63% economically disadvantaged (receiving free or reduced price lunch), which also was representative of the observed students in participating classes. 16% English Language Learners (ELL), and 11% with disabilities (State Report Card 2013-2014). Over the past 20 years, computers, tablets, and internet infrastructure have been added to the school. At the time of observation, five English Language Arts (ELA) and four Social Studies (SS) teachers had iPad carts to use in their classrooms, of which six were female and three were male with an age range from 24 to 50 years old and between one and 17 years of teaching experience. The teachers' class sizes varied from 20 to 33 students. Students were not observed individually, but as a group taking part in a class. Confidentiality was maintained by not including any names or identifying characteristics in the results.

Observations

Teachers were informed about the general parameters of the iPad study, but the observation times were not announced ahead of time so that the researcher could capture an authentic snapshot of actual iPad use in its natural form. An observation protocol was used to gather information on whether teachers and students used the iPads in the classroom and if so, how they used them. Three observations lasting between ten and forty minutes at a time were

conducted at each teacher randomly on various days and at various times of the classroom day during a three-week period. The researcher recorded observations and field notes. The observation protocol allowed the researcher to record the date, time, grade level, and class observed (Social studies or English Language Arts). The protocol prompted the researcher to note if the teacher was using the iPad, and if so, how the teacher was using the iPad, as well as if the students were using the iPads, and if so, how the students were using the iPads.

Interviews

Follow-up interviews were conducted one week after the observations were completed. The researcher conducted informal interviews lasting 10 to 15 minutes with all 9 participating teachers using a semi-structured interview protocol. Teachers were asked about their general iPad use, not just the lessons observed. Teachers were asked if they used iPads to instruct and if so, how. They were also asked if students used the class set of iPads to learn and if so, how. Since many teachers reported they and/or their students did not use the iPads at all or that they used them rarely, they volunteered the reasons for the non-use and the obstacles they and their students perceived to exist.

Results

Data were analyzed to identify themes and patterns of iPad use. First, the question of whether the iPads were being used by the teachers and students was analyzed for a percentage of use versus non-use. Then, the types of use were categorized for teachers and students separately. Categories were identified by looking for themes and key phrases from the observation and interview notes after careful review of the data. A similar method was used to categorize the barriers to iPad use identified in the interviews. Lastly, the percentage of use and the way in which the iPads were used was analyzed in light of the literature review to find out how they correlate

Since one of the themes that emerged from the literature review was that access to technology often does not equate to actual use of it, the observations were totaled and compared to the number of times iPads were being used and the number of times they were not. The interview data was also analyzed to get an average days per month that teachers reported they used iPads. This information is reported under the subheading 'Frequency of iPad Use.' Next, results for how the iPads were observed and reported to be used

by teachers and students are presented in turn. The types of iPad use and frequency were organized by teacher, followed by barriers reported by the teachers as shown in Table 1.

Through qualitative content analysis, types of use by teachers and students were identified through a process of organizing and classifying the data themes and patterns of observed and noted iPad uses, as well as teacher comments, as a “process of digesting the contents of qualitative data and finding related threads in it” (Gay, et al, 2012, p. 467). The first step in analyzing the observations was to organize the data by teacher, observation dates, and type of use. Next, the observation and interview notes were coded to identify patterns and themes and to develop categories of iPad use and barriers which were used to present the results. The codes were not pre-set but emerged from the data analysis.

From the nine classrooms surveyed, three teachers and their students (33.33% of the classrooms) were not observed to use iPads at all, and six classrooms (66.67%) used them for at least one of the observations. Out of the 27 observations of nine classrooms, teachers used iPads during five (18.52%) of the observations. In interviews, teachers reported using iPads an average of 5.6 days per month (28%).

Students used iPads during nine (33.33%) of the 27 observations. In interviews, teachers reported using iPads with students at an average of 7.3 days per month (36.5%). Likewise, during observations

five teachers were using iPads in three different ways: demonstration, presentation, and learning management and a combination of the either, as shown in Table 1. Teachers using iPads during observations were using them to demonstrate to the students what to do through mirroring with AirServer, to present information with PowerPoint, and to manage assignments through Edmodo, a learning management system (LMS) which allows teachers to share assignments and communicate with students and parents for instructional purposes.

From the nine teachers interviewed, three teachers reported they didn’t use their iPads at all. Evidence of such use is shown in Table 1. Among the teachers, one was a veteran teacher and two were new teachers. The remaining six teachers reported using the iPads with varying frequency (Table 4) to demonstrate through mirroring, to manage assignment workflow, and to present information. The categories of use were the same as the observations, but the number of teachers reporting each type of use varied slightly from the observations.

During observations, students were using iPads in nine classes for the following purposes: to read online text, to write an essay and notes, to research online, and to take practice tests for the SBAC (Smarter Balanced Assessment Consortium), a new online test tied to the Common Core shown in Table 2.

Table 1

Teacher iPad Use Observed and Reported

# of Observations	# Teachers Reported	Category of Use	Specific Programs
2	3	Demonstration	AirServer Reflections
2	2	Presentation	PowerPoint
1	1	Assignment Management	Edmodo LMS
0	3	Not used	None

Table 2

Student iPad Use Observed

Number of Times Observed	Category of Use	Specific Examples
3	Reading	read online book/documents
3	Writing	write essay, annotate eBook
2	Research	Google search, Webquest
1	Assessment	SBAC practice test

Table 3

Student iPad Use Reported by Teachers

Number of Times Reported	Category of Use	Specific Examples
4	Research	Google search
3	Reading	Collections online textbook
2	Writing	Google Docs
2	Workflow	get assignments, links
1	Create presentations	Flow boards

Teachers' reported on students use iPads in the classroom. During interviews, teachers reported their students using iPads anywhere from once per month to 4 days per week for a variety of purposes. In English Language Arts classes, students read the online textbook (Collections, by Houghton Mifflin Harcourt). In both Language Arts and Social Studies classes, students conducted research, wrote, accessed assignments, and created presentations with an app called Flowboards. Teachers did not report their students using iPads for assessment, a use which was observed, and they reported students using iPads for workflow and creating presentations, a use which was not observed.

During interviews, teachers reported the ways they and the students use iPads in class, and they estimated how frequently both groups used the iPads in the classrooms as shown in Table 4. Since the observations took place over a period of three weeks, the report of frequencies illustrates the average use over the course of the school year. On average, teachers reported using iPads with students 7.3 days per month, or 36.5% of the time, which is close to twice the time teachers were observed using iPads, but only slightly more than the time students were observed to use iPads.

Perceived barriers that prevent classroom iPad use

Some themes emerged from teachers' reported problems and barriers shown in Table 5, which prevent them from using iPads more frequently. Analyzing the data in light of the research questions revealed the teachers use iPads 18.52% of the time, but they reported they use them an average of 28% of the time, while students were observed to use iPads 33.33% of the time, and teachers reported them to use iPads an average of 36.5% of the time. When iPads were being used by teachers, it was for the purpose of demonstration, assignment management, and presentation. When iPads were being used by students, it was for the purpose of research, reading, writing, and assessment. Teachers who used iPads more frequently used them for a variety of purposes, while others rarely used them for any purpose. The most common barrier reported by teachers was student attitude and preference, followed by teacher attitude and preference and infrastructure problems.

Table 4

Correlation of iPad Use and Frequency by Teacher

Teacher	Teacher iPad Use	Student iPad Use	Frequency Reported Teachers
#1	Presentation	Research, Writing	4 days per week
#2	Presentation	Reading	3 days per week
#3	Demonstration	Notes, Reading	3 days per week
#4	Managing Assignments	Writing	3 days per week
#5	Demonstration	Test Practice	1 day per week
#6	None	Reading	1 day per week
#7	Demonstration	None	1 day per week
#8	None	None	1 day per month
#9	None	None	1 day per month

Table 5

Barriers to iPad Use Reported by Teachers

Teacher	Problems Reported
#1	None
#2	None
#3	50% of students choose iPads, and 50% prefer Chrome books
#4	Students don't like to type on iPads & prefer to read paper books
#5	Prefers laptop; iPads have charging & Wi-Fi connectivity failures
#6	75% of students prefer to read paper book, ¼ prefer reading on iPad
#7	Some students choose to write on phone or paper over iPad
#8	iPads are slow, have Wi-Fi connectivity failures, and lack a keyboard
#9	Prefers laptop; students don't like to use iPads

Discussion and Conclusions

This study explored how teachers and students use iPads in high school classes with iPad carts. Most of the previous studies were conducted with laptops earlier than 10 years or other older forms of technology. Since the iPad is such a new educational technology, and the results showed some similarities with previous studies as well as some surprises.

Teachers in this study were observed to use their iPads 18.52% and reported to use them an average of 28% of the time. In comparison, a 2010 study of observation data from more than 60,000 classrooms across 34 states showed that teachers used some form of technology during 37% of the observations (Pitler, 2011). The study by Pitler combined both rural and urban settings. The Pitler study also looked at a broad range of technologies of all kinds, whereas this study focused solely on iPads, and in a rural high school setting. Still, the low percentage of iPad use the present study found might be surprising to education leaders. There was also a significant gap between the percentage of time observed and reported by teachers. This might indicate they are not aware of how often they actually used their iPads, or that observations took place during a period of lighter use, or that the teachers inflated the numbers in interviews or forgot how often they used iPads.

Students in this study were observed to use iPads in the classroom 33.33% and teachers reported the students use them an average of 36.5% of the time, whereas Pitler's study showed that students used some form of technology during 27% of the observations (Pitler, 2011). As shown in previous studies, access to technology does not equate to its use (Bebell, et al., 2010). Even though overall use of

technology is low, the results of this study could show it may be on the rise, or that iPad availability and familiarization may have caused an increase in student technology use. Since students used the iPads more than their teachers, this may indicate that students are more comfortable, familiar, adept or ready to experiment with iPad technology than teachers. Another possible explanation is that the iPad facilitates student needs and learning activities better than teacher needs.

This study's results support previous research about teachers using technology for class preparation and communication (Bebell, O'Dwyer, Russell, & Hoffman, 2010), as with the use of a learning management system (LMS) or a website to communicate to students about assignments. With regard to instructional delivery, Bebell et al.'s (2010) pre-iPad study found that teachers rarely used technology for delivering instruction, whereas in this study (2015) found that teachers used iPads mostly for delivering instruction through demonstrations and presentations. The implication may be that the iPad lends itself to delivering instruction more than older forms of technology.

As in similar previous studies, students in the present study were reported to use technology for research and productivity (Wetzel, Zambo, & Ryan, 2007) as exemplified by researching on Google and writing essays and annotations. By contrast, some uses emerged which were not shown in previous research. Reading online text, taking online assessments, and accessing assignments online were types of use not reported in previous studies. The implication is that this usage is aided by several factors including availability iPads.

The Common Core State Standards call for students to "use technology ... to produce and

publish writing and to interact and collaborate with others” (National Governors Association, 2010, CCSS.ELA-Literacy.CCRA.W.6). In this study, students were observed and reported to use iPads to produce writing, but not to publish it, and they were not observed or reported to use iPads to interact or collaborate with others. Similarly, the ISTE standards call for creativity, innovation, and collaboration among other important skills students should learn with technology (ISTE, 2015), and students in the study were not using the iPads for these purposes. When they used iPads, it was to do individual work, so the present study of iPad use shows a need to incorporate creativity and collaboration and to publish writing for a global audience in order to meet the demands of the Common Core State Standards and ISTE.

Teachers in the present study used iPads infrequently for the purposes of demonstration and presentation and the combination of the same in a teacher-centered environment, but previous studies show that iPad calls for teachers to shift their instructional design to a learner-centered environment focusing on creation over consumption of information, which should lead to higher student engagement and greater frequency of use (Jahnke & Kumar, 2014). Similarly, students in the present study were using iPads infrequently and individually for the purposes of reading, writing, and research, essentially substituting the iPad for books and paper; however, previous studies show the need to shift student learning activities with iPads to content creation and collaboration in order to make the most of the capabilities of the technology and to encourage more frequent classroom use (Herro, Kiger, and Owens, 2013).

Teachers in this study named student attitude and preference as the main barrier to classroom iPad use, a barrier which was not found in the literature review. Most educators assume students will be eager to use iPads, but a majority of teachers in this study found that not to be true. There may be many reasons for this, including instructional design incorporating iPads in the classroom and the teacher’s attitude and confidence with the devices (Holden & Rada, 2011). The second most common barrier mentioned by teachers was their preference for older, more familiar technology such as laptops. This barrier is seen in the literature, as a teacher’s comfort level and perception of the usefulness of a device as key factor in their likelihood to adopt it (Holden & Rada, 2011; Herro et al., 2013). The last barrier mentioned by teachers was

infrastructure problems such as Wi-Fi connectivity issues, a barrier which was also identified in Herro et al.’s 2013 study.

Some barriers that appeared in the literature review were not mentioned by teachers in this study, including administrative support and professional development. Bebell and O’Dwyer (2010) named district and administrative policies and accountability as a necessary factor in successful technology integration. Herro et al. (2013) and Fletcher (2012) specified that effective professional development should include supportive communities, modeling, and peer coaching. It could be that teachers did not identify those factors as barriers because they are unaware that they should be in place.

Theoretical and Practical Implications

Teachers in this study usually did not adequately plan lessons to incorporate technology into their instructional design as called for by Jahnke and Kumar in their 2014 iPad study. Models of technology acceptance showed that time plays a factor, and the teachers in this study had been using iPads for only six months at the time of the study, which supports the literature pointing to the need for teachers to have more time to experiment and to feel comfortable incorporating new technologies such as iPads into their teaching (Fletcher, 2012). This means that teachers having technology in their classrooms is not enough, but need enough training on the use, modeling and integration in various subjects and topics.

The findings show that overall usage of iPads by both teachers and students was very low. Teachers and administrators may need to examine the difficulties involved with incorporating iPads and such technologies effectively into instruction and student learning. Also, by knowing that iPads provide themselves to research and writing might help school leaders and teachers to incorporate them more effectively by focusing on such use to begin with.

Recommendations for Further Research

The findings in this study show that there are several questions about how teachers and students use iPads in rural high school classrooms. Future research on teacher use of iPads might focus on the experience levels and other unique characteristics of the teachers who use the iPads versus those who do not. It would also be helpful to investigate options to overcome the barriers which prevent teachers and students from using iPads in the classroom. For

example, could professional development scaffolding a shift in instructional style to learner-centered creativity and collaboration boost frequency, quality and value of use? Further research is needed to assess the effectiveness of various types of professional development on the use of iPads. It is through professional development various new ideas and training on new technologies is learned and trainees broaden the understanding of new technologies such as different apps on the iPad. Regarding the question of technology's impact, the reason iPads are purchased by schools is to supposedly improve student achievement. It would also be useful to find a connection between iPad use and achievement, whether for certain subjects or overall.

Overall, iPads were not being used by teachers and students as often as one might expect. Teachers seemed to prefer to instruct without the iPad most of the time, but when they did use an iPad in class, it was usually to aid in delivering instruction. Students learned without the iPads most of the time, but when they did use iPads in class, it was usually to read, write, or do research. The low overall use of iPads relates to the way in which they were used in a teacher-centered manner for the consumption of information rather than for creativity and collaboration. It may be necessary to investigate how to overcome the barriers which are preventing the iPad from being used to positively impact performance and achievement and to transform instruction.

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